**Starch**

Science Explorers

**What is Starch?**

 We’re going to start with a quick youtube video (https://www.youtube.com/watch?v=UaF8vKEg0ro) about what starch is and where it comes from and a quick discussion of what we’re doing today. Once that’s done, talk with your students and see if they can come up with foods which have starch in them. On the worksheet, go through each food and guess whether it has starch in it or not by filling in the row labelled “Guess if it has starch” with a yes or no for each food item.

**Testing for Starch**

 We can test whether a food has starch in it by using iodine. Normally iodine in water is colorless or brown. However, in the presence of starch, it turns dark purple, so we can test for starch by adding iodine to each food. Fill out the row in the table labelled “Guess if iodine will turn purple” with a yes or no for each food item.

Note: If it’s taking a long time, you don’t have to do each one.

Materials:

* Iodine
* Water
* Measuring spoons
* Eyedropper
* 9 Small cups
* Assorted foods

Instructions:

1. Fill a small cup with two teaspoons of water and 1/8 teaspoon of iodine. Make sure you do this step as iodine can be harmful if swallowed and can stain clothes.
2. Collect a small amount ( ~ 1 tsp) of sugar, salt, and cornstarch in small cups. Label them and add enough water to dissolve the food. It’s okay if it doesn’t totally dissolve
3. In more cups place a piece of bread, a carrot, an apple, and a piece of a cracker.
4. To each cup of solid or dissolved food, add a single drop of iodine solution. You should see an immediate color change. Record in the table whether the iodine turned purple or not.
5. Discuss with the students what the color change means and whether each food has starch in it or not. Fill in the last row of the table.

What’s going on here:

 This iodine and starch reaction isn’t actually that well understood. It’s thought that the starch wraps around the iodine, slightly changing the amount of electrons on the iodine and changing the wavelength of light that iodine can absorb, therefore changing the color of the solution.

**Digesting Starch – Skip if too long –**

 Because starch is a long chain of sugars, for our bodies to effectively use the starch that we eat, it needs to be broken down. This process actually starts in our mouths with saliva. We can test this with iodine and some crackers.

Materials:

* 2 cups and some water
* A cracker
* Iodine solution from previous experiment
* Eyedropper

Instructions:

1. Get two cups, label them cracker and saliva. Fill each halfway with water.
2. Crush half a cracker in each cup and stir.
3. Put a single drop of iodine in each cup. They should both turn purple.
4. Spit (or have your students spit) into the cup marked saliva.
5. Wait for a few minutes (up to 20) for the saliva to break up the starch chains. In the mean time, you can move onto the next experiment.
6. After the saliva has done its work, the cup labelled cracker should be blue, and the one labelled saliva should not be blue.

What’s happening here:

 The iodine only changes color because the long starch chains wrap around the iodine. When we add saliva, the enzyme salivary amylase breaks up the starch into smaller two sugar groups. Because the starch isn’t a long chain any more

**Oobleck**

 Cornstarch is often used in cooking as a thickener in things like gravy and soups. This is because the long chains of the cornstarch sticks to itself pretty well. To demonstrate this property of starch, we’ll make something called Oobleck (named for a Dr. Seuss poem) which has some unusual characteristics.

Materials:

* Paper to put down on the table
* A Tupperware container
* 2 cups of cornstarch
* Approximately 1 cup of water
* Food coloring if desired

Instructions

1. Put down paper to cover the table. This can get messy.
2. Put 2 cups of cornstarch in the Tupperware container.
3. Add water (and food coloring) until it makes a liquid which can be stirred slowly but becomes hard when quick movements are used.
4. Try rolling around the oobleck in your hand. Does it stick together? What if you stop?
5. Clean up any mess with warm water. Do not dump down the drain! Throw it away instead.

What’s going on: With just enough water to make a liquid, the oobleck can flow freely when not disturbed as the water comes between individual starch chains. However, when you push rapidly on it, the starch chains press against each other, pushing the water out and essentially making a solid.

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| **Food** | Water | Salt | Sugar | Cornstarch | Crackers | Bread | Carrot | Apple |
| **Guess if it has starch** |  |  |  |  |  |  |  |  |
| **Guess if iodine will turn purple** |  |  |  |  |  |  |  |  |
| **Did iodine turn purple?** |  |  |  |  |  |  |  |  |
| **Does it have starch?** |  |  |  |  |  |  |  |  |